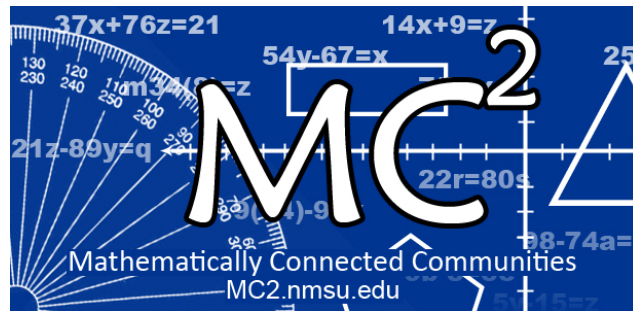


# Mathematically Connected Communities



## PARCC Practice Test Items Algebra II - Mathematics

Excerpted 11/2014 from  
PARCC Online Practice Tests  
[www.parcconline.org](http://www.parcconline.org)

## Mathematical Practice Questions for MC<sup>2</sup> Thinking Protocol

Follow the process below in working with the PARCC practice items found in this packet:

1. Choose items from this packet that relate to math concepts studied in the current or previous curriculum units during your math instruction. Each item may be used as a practice item worksheet.
2. Choose a set of **Thinking/Writing Prompts** below based on the math practice the class is working to develop.
3. Add the prompts to the practice item worksheet or display the prompts for the students to respond to.
4. Continue using the same set of prompts for an extended period of time so children develop competence and confidence in describing their mathematical thinking related to the math practice.

The questions below were intentionally not included on each MC<sup>2</sup> PARCC practice item worksheet in this packet. These are intended to help students move beyond “answer getting” to fully making sense of test item questions and their own mathematical thinking.

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### Thinking/Writing Prompts to Promote Mathematical Practices

#### Math Practice 1: Make sense of problems and persevere in solving them.

1. What do I know about the problem?
2. What questions do I have?
3. Explain your reasoning or thinking in solving the problem.

#### Math Practice 3: Construct viable arguments and critique the reasoning of others.

1. What are the assumptions, definitions, and previous knowledge to help in thinking about this problem?
2. What are some possible conjectures that you have about the problem?
3. Explain your mathematical argument so that somebody else can make sense of your thinking.

**Algebra II PARCC EOY Sample Assessment Item #1 (non-calculator): Standard A-APR.2**

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If  $k$  is a constant, what is the value of  $k$  such that the polynomial  $k^2x^3 - 6kx + 9$  is divisible by  $x - 1$ ?

$k =$

Algebra II PARCC EOY Sample Assessment Item #2 (non-calculator): Standard A-Int. 1

What is the solution of the equation  $\frac{2m^2 + 3m - 5}{m^2 + 4m - 5} = 4$ ?

Enter your answer in the space provided. Enter only your answer. You may not need to use all of the answer boxes.



$m =$

$m =$

- ▶ Numbers
- ▶ Arithmetic and Units
- ▶ Exponents, Roots, Logs
- ▶ Relations
- ▶ Geometry
- ▶ Groups

Algebra II PARCC EOY Sample Assessment Item #3 (non-calculator): Standard A-REI.2

What extraneous solution arises when the equation  $\sqrt{x+3} = 2x$  is solved for  $x$  by first squaring both sides of the equation?

Calculator interface showing a toolbar with mathematical symbols (undo, redo, clear, delete, +, -, ×, ÷, fraction, decimal, power, square root, =, ≈) and a large input area containing the text  $x =$  followed by a cursor. To the right of the input area is a vertical menu with the following categories: Numbers, Arithmetic and Units, Exponents, Roots, Logs, Relations, Geometry, and Groups.

Consider the equation  $\frac{4^{x^2}}{2^x} = 2$ .

**Part A**

Which equation is equivalent to the equation shown?

Select the correct answer.

- A.  $2^{x^3} = 2$
- B.  $2^{x^3-x} = 2$
- C.  $2^{2x} = 2$
- D.  $2^{2x^3-x} = 2$

**Part B**

Which values are solutions to the equation?

Select **all** that apply.

- A.  $-2$
- B.  $-1$
- C.  $-\frac{1}{2}$
- D.  $\frac{1}{2}$
- E.  $1$
- F.  $2$

**Algebra II PARCC EOY Sample Assessment Item #5 (non-calculator): Standard N-CN.2**

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The table shows several complex numbers, where  $i$  is the imaginary unit.

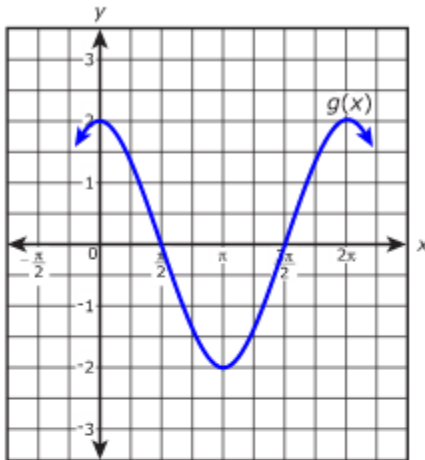
Select **all** appropriate cells in the table where the product of the two numbers is a real number.

	$8 - 2i$	3	$i$
$8 + 2i$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$5i$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$-4$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The function  $f(x) = \cos(x)$

Part A

Function  $g$  results from a transformation on function  $f$ . A portion of its graph is shown



What is the equation of  $g(x)$ ?

Write your answer in the form  $g(x) = a \cos(bx) + c$ , using real numbers for  $a$ ,  $b$ , and  $c$ .

Enter your answer in the box.

Calculator interface showing a toolbar with buttons for undo, redo, clear, backspace, plus, minus, multiply, divide, fraction, square root, power, and equals.

$g(x) =$

- ▶ Arithmetic and Units
- ▶ Exponents, Roots, Logs
- ▶ Relations
- ▶ Geometry
- ▶ Groups
- ▶ Trigonometry



**Part A**

An expression is given.

$$x^2 - 8x + 21$$

Determine the values of  $h$  and  $k$  that make the expression  $(x - h)^2 + k$  equivalent to the given expression.

Enter your answers in the space provided. Enter **only** your answer.



$h =$

$k =$

- ▶ Numbers
- ▶ Arithmetic and Units
- ▶ Exponents, Roots, Logs
- ▶ Relations
- ▶ Geometry
- ▶ Groups

**Part B**

An equation is given.

$$x^2 - 8x + 21 = (x - 4)^2 + 3x - 16$$

Find one value of  $x$  that is a solution to the given equation.

Use the Equation Editor. Enter **ONLY** your solution.



$x =$

- ▶ Numbers
- ▶ Arithmetic and Units
- ▶ Exponents, Roots, Logs
- ▶ Relations
- ▶ Geometry
- ▶ Groups

Given that  $x > 0$ , which expression is equivalent to  $5\sqrt{xy} + 25\sqrt{x}$  ?

- A.  $5(xy)^{-1} + 25x^{-1}$
- B.  $25x^{\frac{1}{2}}(\sqrt{y} + 5)$
- C.  $\sqrt{x}(25y^{\frac{1}{2}} + 5)$
- D.  $5x^{\frac{1}{2}}(y^{\frac{1}{2}} + 5)$

What is the solution of the system of linear equations?

$$\begin{cases} x - 9y + 4z = 1 \\ -2x + 9y - 4z = -3 \\ 2x + y - 4z = -3 \end{cases}$$

Enter your answers in the boxes.

$x =$   ,  $y =$   ,  $z =$

**Algebra II PARCC EOY Sample Assessment Item #2 (Calculator Part): Standard A-SSE.2-3**

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The expression  $x^2(x - y)^3 - y^2(x - y)^3$  can be written in the form  $(x - y)^a(x + y)$ , where  $a$  is a constant. What is the value of  $a$ ?

Enter your answer in the box.

$a =$

**Algebra II PARCC EOY Sample Assessment Item #3 (Calculator Part): Standard F-IF.6-2**

An investor deposited \$5,000 in an account that earns 1% annual interest. The amount of money in the account is represented by the function  $f(x) = 5,000(1.01)^x$ , where  $x$  represents the number of years since the account was opened.

What is the average rate of change of the function between  $x = 2$  and  $x = 7$ ?

Select from the drop-down menus to correctly complete the sentence.

The average rate of change is  .

- 37.17
- 51.53
- 52.04
- 72.14

- dollars
- dollars per year
- years
- years per dollar

Paul started to train for a marathon. The table shows the number of miles Paul ran during each of the first three weeks after he began training.

Week	1	2	3
Distance (miles)	10	12	14.4

If this pattern continues, which of the listed statements could model the number of miles Paul runs  $a_n$ , in terms of the number of weeks,  $n$ , after he began training?

Select all that apply.

- A.  $a_n = 10 + 2(n - 1)$
- B.  $a_n = 10n^2$
- C.  $a_n = 10(1.2)^{n-1}$
- D.  $a_1 = 10, a_n = 1.2a_{n-1}$
- E.  $a_1 = 10, a_n = 2 + a_{n-1}$

Algebra II PARCC EOY Sample Assessment Item #5 (Calculator Part): Standard N-RN.2

If  $\sqrt{\sqrt[3]{(x+1)^5}} = (x+1)^a$ , for  $x \geq -1$ , and  $a$  is a constant, what is the value of  $a$ ?

Enter your answer in the space provided. Enter **only** your fraction.



- ▶ Numbers
- ▶ Arithmetic and Units
- ▶ Exponents, Roots, Logs
- ▶ Relations
- ▶ Geometry
- ▶ Groups
- ▶ Trigonometry
- ▶ Statistics
- ▶ Greek

Algebra II PARCC EOY Sample Assessment Item #6 (Calculator Part): Standard F-TF.8-2

Angle  $\theta$  is in Quadrant II, and  $\sin \theta = \frac{4}{5}$ . What is the value of  $\cos \theta$ ?

Enter your answer in the space provided. Enter **only** your fraction.

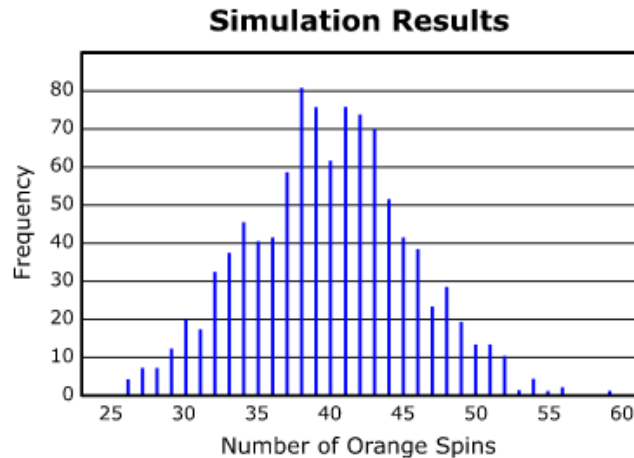


- ▶ Numbers
- ▶ Arithmetic and Units
- ▶ Exponents, Roots, Logs
- ▶ Relations
- ▶ Geometry
- ▶ Groups
- ▶ Trigonometry
- ▶ Statistics
- ▶ Greek



**Algebra II PARCC EOY Sample Assessment Item #7 (Calculator Part): Standard S-IC.2**

A circular spinner is divided into five sectors of different colors. A student spun the arrow on the spinner 200 times and recorded that the arrow stopped on the orange sector 38 times out of the 200 spins. To test whether the spinner was fair, the student used a computer to simulate the number of times the arrow stops on orange in 200 spins of a fair spinner equally divided into five sectors of different colors. The results of 1,000 trials of the simulation are shown.



Based on the results of the simulation, is there statistical evidence that the spinner is not fair?

- A. Yes, because 38 was the most frequent outcome.
- B. Yes, because about 8% of the outcomes were 38.
- C. No, because the distribution is approximately normal.
- D. No, because an outcome of 38 or less is not unusual.

Algebra II PARCC EOY Sample Assessment Item #8 (Calculator Part): Standard F-BF.1b-1

The functions  $f$  and  $g$  are defined by  $f(x) = x^2$  and  $g(x) = 2x$ , respectively. Rewrite the function  $h(x) = \frac{f(2x)g(-2x)}{2}$  in terms of  $x$ .

Enter your answer in the space provided.

Calculator interface showing a row of buttons: undo, redo, clear, delete, plus, minus, multiply, divide, fraction, decimal, power, square root, equals, and approximate.

Input area for the answer:  $h(x) = \square$ . A sidebar menu on the right contains the following categories: Numbers, Arithmetic and Units, Exponents, Roots, Logs, Relations, Geometry, Groups, Trigonometry, and Statistics.

**Algebra II PARCC EOY Sample Assessment Item #9 (Calculator Part): Standard A-REI.11-2**

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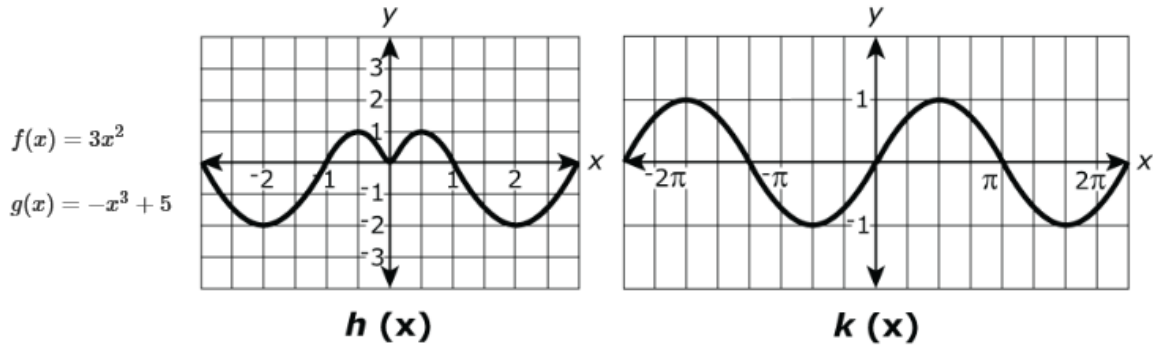
Given the functions  $h(x) = |x - 4| + 1$  and  $k(x) = x^2 + 3$ , which intervals contain a value of  $x$  for which  $h(x) = k(x)$ ?

Select all that apply.

- A.  $-4.5 < x < -3$
- B.  $-3 < x < -1.5$
- C.  $-1.5 < x < 1.5$
- D.  $1.5 < x < 3$
- E.  $3 < x < 4.5$

**Algebra II PARCC EOY Sample Assessment Item #10 (Calculator Part): Standard F-BF.3-3**

For each function described by the equations and graphs shown, indicate whether the function is even, odd, or neither even nor odd by selecting the appropriate cell.



	$f(x)$	$g(x)$	$h(x)$	$k(x)$
Even	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Odd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Neither Even nor Odd	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Algebra II PARCC EOY Sample Assessment Item #11 (Calculator Part): Standard A-REI.7**

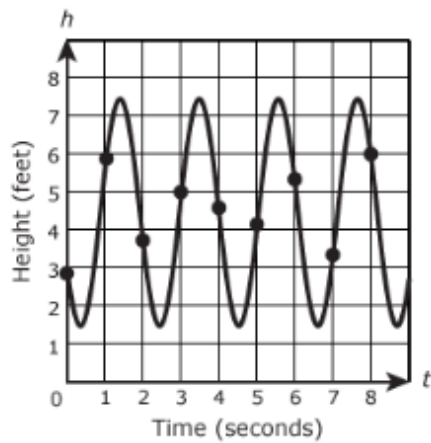
For each system of equations shown in the table, determine the number of points of intersection.

Select one cell for each row.

System	No points of intersection	One point of intersection	Two points of intersection
$\begin{cases} y = 1 - x^2 \\ y = x - 1 \end{cases}$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$\begin{cases} y = 1 - x^2 \\ y = 1 \end{cases}$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$\begin{cases} y = 1 - x^2 \\ y = 2 - x \end{cases}$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Algebra II PARCC EOY Sample Assessment Item #12 (Calculator Part): StandardF-IF.6-7

The graph models the height  $h$  above the ground, in feet, at time  $t$  seconds of a person swinging on a swing. Each point indicated on the graph represents the height of the person above the ground at the end of each one-second interval.



Over each interval, the average rate of change in the height, in feet per second, of the person on the swing can be calculated. Order the intervals from least to greatest, based on the corresponding rate of change.

Drag and drop each interval to the correct position.

From 0 seconds to 1 second

From 2 seconds to 3 seconds

From 7 seconds to 8 seconds

Least

Greatest

A scientist places 7.35 grams of a radioactive element in a dish. The half-life of the element is 2 days. After  $d$  days, the number of grams of the element remaining in the dish is given by the function

$R(d) = 7.35\left(\frac{1}{2}\right)^{\frac{d}{2}}$ . Which statement is true about the equation when it is rewritten without a fractional exponent?

Select all that apply.

- A. An approximately equivalent equation is  $R(d) = 7.35(0.250)^d$ .
- B. An approximately equivalent equation is  $R(d) = 7.35(0.707)^d$ .
- C. The base of the exponent in this form of the equation can be interpreted to mean that the element decays by 0.250 grams per day.
- D. The base of the exponent in this form of the equation can be interpreted to mean that the element decays by 0.707 grams per day.
- E. The base of the exponent in this form of the equation can be interpreted to mean that about 25% of the element remains from one day to the next day.
- F. The base of the exponent in this form of the equation can be interpreted to mean that about 70.7% of the element remains from one day to the next day.

## Algebra II PARCC EOY Sample Assessment Item #15 (Calculator Part): Standard A-SSE.2-6

Write the expression  $x - xy^2$  as the product of the greatest common factor and a binomial.  
Then, determine the complete factorization of  $x - xy^2$ .

Enter your answers in the boxes.



Product of greatest common factor and binomial :

Complete factorization :

▸ Numbers

▸ Arithmetic and Units

▸ Exponents, Roots, Logs

▸ Relations

▸ Geometry

▸ Groups

▸ Trigonometry

▸ Statistics

▸ Greek



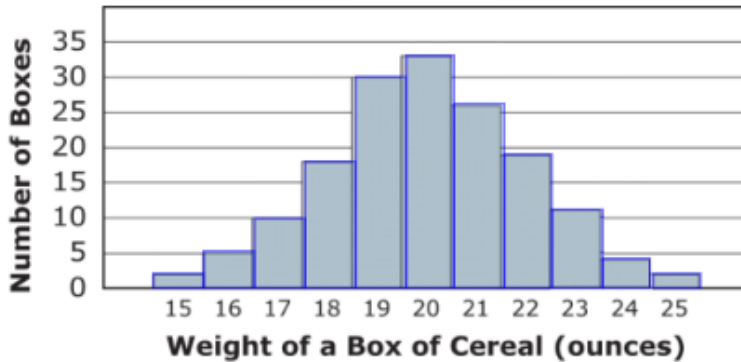
**Algebra II PARCC EOY Sample Assessment Item #16 (Calculator Part): Standard S-ID.4**

The distribution of weights (rounded to the nearest whole number) of all boxes of a certain cereal is approximately normal with mean 20 ounces and standard deviation 2 ounces.

**Part A**

A sample of boxes of the cereal was selected and the weights of the selected boxes are represented in the histogram. Click on all bars of the histogram that represent the rounded weights of boxes in the sample that are within 1.5 standard deviations of the mean weight of all boxes of the cereal.

Select all that apply.



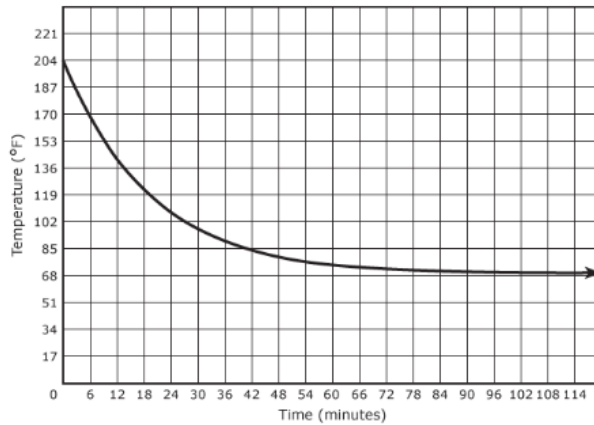
**Part B**

Use the histogram to estimate the number of boxes in the sample with a weight that is more than 1.5 standard deviations above the mean.

- A. 2
- B. 6
- C. 17
- D. 36

Algebra II PARCC EOY Sample Assessment Item #18 (Calculator Part): Standard F-IF.4-2

The graph represents the temperature, in degrees Fahrenheit ( $^{\circ}\text{F}$ ), of tea for the first 120 minutes after it was poured into a cup.



**Part A**

Based on the graph, what was the temperature of the tea when it was first poured into the cup?

- A.  $68^{\circ}$
- B.  $114^{\circ}$
- C.  $136^{\circ}$
- D.  $204^{\circ}$

**Part B**

Based on the graph, as the number of minutes increased, what temperature did the tea approach?

- A.  $68^{\circ}$
- B.  $114^{\circ}$
- C.  $136^{\circ}$
- D.  $204^{\circ}$

**Algebra II PARCC EOY Sample Assessment Item #19 (Calculator Part): Standard A-SSE.4-2**

An investor deposits  $g$  dollars into an account at the beginning of each year for  $n$  years. The account earns an annual interest rate of  $r$ , expressed as a decimal. The amount of money  $S$ , in dollars, in the account can be determined by the formula  $S = \frac{g}{r} [(1 + r)^n - 1]$ .

**Part A**

Suppose the investor deposits \$500 a year for 10 years into an account that earns an annual interest rate of 5%. If no additional deposits or withdrawals are made, what will be the balance in the account at the end of 10 years?

- A. \$6,003.05
- B. \$6,015.06
- C. \$6,288.95
- D. \$6,301.52

**Part B**

Enter a number in the answer box to complete the sentence. Give your answer to the nearest cent.

Suppose the investor wanted the balance in the account to be at least \$12,000 at the end of 10 years. At an annual interest rate of 5%, the amount of the yearly deposit should be at least \$  .

## Algebra II PARCC EOY Sample Assessment Item #20 (Calculator Part): Standard s-CP.Int.1

The two-way table shows the classification of students in a mathematics class by gender and dominant hand. A student who is ambidextrous uses both hands equally well.

	Right-handed	Left-handed	Ambidextrous	Total
Male	11	4	1	16
Female	12	2	0	14
Total	23	6	1	30

### Part A

What is the probability that a randomly selected student in the class is female given that the student is right-handed?

Enter your answer in the space provided. Enter only your fraction.



A large empty input area for the answer, with a small square cursor in the center. To the right is a vertical menu with the following categories: Numbers, Arithmetic and Units, Exponents, Roots, Logs, Relations, Geometry, Groups, Trigonometry, and Statistics.

### Part B

One student will be selected at random from the class.

Consider the events:

$X$  the selected student is female

$Y$  the selected student is right-handed

Which statement about events  $X$  and  $Y$  is true?

- A. The events are independent because the number of right-handed students in the class is larger than the number of female students.
- B. The events are independent because the number of categories for dominant hand is different from the number of categories for gender.
- C. The events are not independent because for one of the dominant hand categories the number of female students is 0.
- D. The events are not independent because the probability of  $X$  is not equal to the probability of  $X$  given  $Y$ .

The London Eye, a Ferris wheel in England, has a diameter of 120 meters. The wheel completes a full rotation in 30 minutes at a speed which allows passengers to enter a capsule at the base of the Ferris wheel without stopping the wheel. At the highest point, a capsule reaches a height of 135 meters above the ground.

The height above the ground, in meters, of a capsule  $x$  minutes after it starts at the base of the Ferris wheel can be modeled by

$$f(x) = A \cdot \cos\left(\frac{\pi}{15} x\right) + B, \text{ where } A \text{ and } B \text{ are constants.}$$

**Part A**

What values of  $A$  and  $B$  define the model?

Enter your answers in the boxes.

$A =$   and  $B =$

**Part B**

Consider a capsule that begins its rotation at the base of the London Eye. At which of the times listed will the capsule be 45 meters above the ground?

Select all that apply.

- A. 15 minutes
- B. 25 minutes
- C. 35 minutes
- D. 45 minutes
- E. 55 minutes
- F. 65 minutes

Consider the expression  $6x^3 - 5x^2y - 24xy^2 + 20y^3$ .

**Part A**

Which expression is equivalent to  $6x^3 - 5x^2y - 24xy^2 + 20y^3$  ?

- A.  $x^2(6x - 5y) + 4y^2(6x + 5y)$
- B.  $x^2(6x - 5y) + 4y^2(6x - 5y)$
- C.  $x^2(6x - 5y) - 4y^2(6x + 5y)$
- D.  $x^2(6x - 5y) - 4y^2(6x - 5y)$

**Part B**

Which expressions are factors of  $6x^3 - 5x^2y - 24xy^2 + 20y^3$  ?

Select **all** that apply.

- A.  $x^2 + 4y^2$
- B.  $6x - 5y$
- C.  $x + 2y$
- D.  $6x + 5y$
- E.  $x - 2y$

Algebra II PARCC EOY Sample Assessment Item #24 (Calculator Part): Standard F-IF.4-2

**Part A**

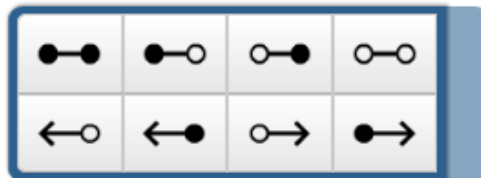
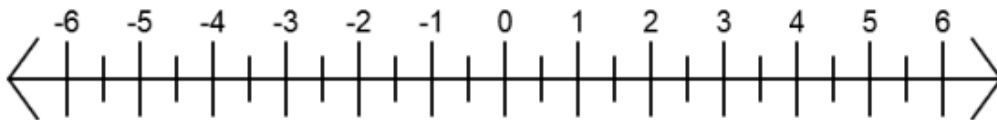
What is the  $y$ -intercept of the graph of the function in the coordinate plane?

Enter your answer in the box.

**Part B**

For what values of  $x$  is  $f(x) > 0$ ? Show your answer on the number line.

Select a solution set indicator. Drag the points on the indicator to the appropriate locations on the number line.



**Part C**

What is the end behavior of the graph of the function?

- A. As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \infty$ , and as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$ .
- B. As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow \infty$ , and as  $x \rightarrow \infty$ ,  $f(x) \rightarrow -\infty$ .
- C. As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$ , and as  $x \rightarrow \infty$ ,  $f(x) \rightarrow \infty$ .
- D. As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow -\infty$ , and as  $x \rightarrow \infty$ ,  $f(x) \rightarrow -\infty$ .

**Part D**

How many relative maximums does the function have?

- A. none
- B. one
- C. two
- D. three